NF-Ys affect iron and nitrate homeostasis in *Medicago truncatula*

Wang J.1, Xiao Q.1, Gao, J.P. 1, Xu P.2, Cousins D.3, and Murray J. D. \*1,3

*jeremy.murray@jic.ac.uk*

*1. CAS-JIC Centre of Excellence for Plant and Microbial Science (CEPAMS), Centre for Excellence in Molecular Plant Sciences (CEMPS), Shanghai Institute of Plant Physiology and Ecology (SIPPE), Chinese Academy of Sciences, China.*

*2. Shanghai Engineering Research Center of Plant Germplasm Resource, College of Life Sciences, Shanghai Normal University, Shanghai 200234, China*

*3. John Innes Centre, Norwich Research Park, Norwich, NR4 7UH, UK*

Most legumes can interact with beneficial N-fixing bacteria called rhizobia. Shortly after contact with the rhizobia, components of the heterotrimeric Nuclear Factor Y (NF-Y) transcription factor complex, comprised of A, B and C subunits, are induced in the roots of the host. In *Medicago truncatula*, these subunits are encoded by multiple genes, 8 *NF-YA*s, 19 *NF-YB*s and 11 *NF-YC*s, of which *NF-YA1* has been implicated in rhizobial infection and nodule formation [1]. We investigated the role of *NF-YB7*, which is induced in *M. truncatula* root hairs in response to rhizobia and Nod factors [2]. We determined that NF-YB7 can interact with NF-YA1, and that loss of NF-YB7 reduced the formation of rhizobial infection threads. Contrary to expectation, *M. truncatula* roots overexpressing NF-YA1 and NF-YB7 (NFYox) showed suppressed nodule formation. Investigated of this phenomenon using RNAseq revealed that abscisic acid signaling is activated in NFYox roots. In addition, NFYox roots showed increased expression of *Ferritin* and deregulation of other iron related genes, and accumulated iron. Genes involved nitrate uptake and nitrate signaling were strongly repressed in NFYox roots, and comparison with ChIP-seq data revealed that amongst these, *NIN-like protein 1* and *Nitrate Transporter 1.1B* were direct targets. Co-expression of the ABA degrading enzyme CYP707A restored the ability of NFYox roots to nodulate. Our results suggest that ABA may serve as a negative feedback mechanism directly downstream of the NF-Ys during nodulation and reveals a potential role for NF-Ys in alleviating nitrate's negative effect on nodulation and in nodule iron homeostasis.

***References:***

[1] Laloum T., et al. Two CCAAT-box-binding transcription factors redundantly regulate early steps of the legume-rhizobia endosymbiosis. Plant J. 2014, 79:757-68.

[2] Breakspear A., et al. The root hair "infectome" of Medicago truncatula uncovers changes in cell cycle genes and reveals a requirement for auxin signaling in rhizobial infection. Plant Cell. 2014 26:4680-701.